CLAIMS

What is claimed is:

1. A spin-valve type magnetoresistance sensor comprising:

a free ferromagnetic layer;

a pinned ferromagnetic layer;

a non-magnetic spacer layer which is sandwiched between the free ferromagnetic layer and the pinned ferromagnetic layer;

an anti-ferromagnetic layer which is disposed adjacent to the pinned ferromagnetic layer;

a non-magnetic back layer which is disposed adjacent to the free ferromagnetic layer and which is stacked on the opposite side of the free ferromagnetic layer from the non-magnetic spacer layer; and

an electron-reflective layer which is disposed adjacent to the back layer and which is stacked on the opposite side of the back layer from the free ferromagnetic layer.

2. The sensor of claim 1, wherein the anti-ferromagnetic layer is used to pin the direction of magnetization of the pinned ferromagnetic layer.

3. The sensor of claim 1, wherein the electron-reflective layer consists of an oxide.

4. The apparatus of claim 3, wherein the oxide is a metal oxide.

5. The device according to claim 4, wherein the metal oxide is formed by:

forming a metal film on the surface of the back layer; and

exposing the metal on the surface of the back layer to an oxidizing atmosphere.

6. The device according to claim 5, wherein the metal film on the surface of the back layer is more readily oxidized than the back layer.

7. The device according to claim 5 further comprising forming the metal film with a thickness of approximately 0.5 to 1.75 nm.

8. The device according to claim 1, wherein the non-magnetic back layer has a thickness of approximately 0.5 to 1.5 nm.

9. The device according to claim 1, wherein:

the non-magnetic back layer is a metal; and

the metal acts as an oxidizing agent with respect to the electron-reflective layer.

10. A magnetic head comprising:

a free ferromagnetic layer;

a pinned ferromagnetic layer;

a non-magnetic spacer layer which is sandwiched between the free ferromagnetic layer and the pinned ferromagnetic layer;

an anti-ferromagnetic layer which is disposed adjacent to the pinned ferromagnetic layer;

a non-magnetic back layer which is disposed adjacent to the free ferromagnetic layer and which is stacked on the opposite side of the free ferromagnetic layer from the non-magnetic spacer layer; and

an electron-reflective layer which is disposed adjacent to the back layer and which is stacked on the opposite side of the back layer from the free ferromagnetic layer.

11. An apparatus for sensing magnetic flux comprising:

a spin-valve type magnetoresistance sensor having:

a free ferromagnetic layer;

a pinned ferromagnetic layer;

a non-magnetic spacer layer which is sandwiched between the free ferromagnetic layer and the pinned ferromagnetic layer;

an anti-ferromagnetic layer which is disposed adjacent to the pinned ferromagnetic layer;

a non-magnetic back layer which is disposed adjacent to the free ferromagnetic layer and which is stacked on the opposite side of the free ferromagnetic layer from the non-magnetic spacer layer; and

an electron-reflective layer which is disposed adjacent to the back layer and which is stacked on the opposite side of the back layer from the free ferromagnetic layer.

12. A method for building a magnetoresistance device, comprising:

forming a free ferromagnetic layer;

forming a pinned ferromagnetic layer;

forming a non-magnetic spacer layer which is sandwiched between the free ferromagnetic layer and the pinned ferromagnetic layer;

forming an anti-ferromagnetic layer which is disposed adjacent to the pinned ferromagnetic layer;

forming a non-magnetic back layer which is disposed adjacent to the free ferromagnetic layer and which is stacked on the opposite side of the free ferromagnetic layer from the non-magnetic spacer layer; and

forming an electron-reflective layer which is disposed adjacent to the back layer and which is stacked on the opposite side of the back layer from the free ferromagnetic layer.

13. The method of claim 12 wherein forming the electron-reflective layer prevents the free ferromagnetic layer from oxidizing.

14. The method of claim 12 wherein forming the non-magnetic back layer prevents the free ferromagnetic layer from oxidizing.

15. The method of claim 12 wherein forming the electron-reflective layer and the non-magnetic back layer prevents the free ferromagnetic layer from oxidizing.

16. The method of claim 12 wherein forming the electron-reflective layer further comprises:

forming a film of a metal on the non-magnetic back layer that is more easily oxidized than the non-magnetic back layer; and

oxidizing the film of the metal in an oxidizing atmosphere.

17. A magnetic storage device comprising:

a plurality of magnetizable surfaces; and

a magnetic sensing head having:

a free ferromagnetic layer;

a pinned ferromagnetic layer;

a non-magnetic spacer layer which is sandwiched between the free ferromagnetic layer and the pinned ferromagnetic layer;

an anti-ferromagnetic layer which is disposed adjacent to the pinned ferromagnetic layer;

a non-magnetic back layer which is disposed adjacent to the free ferromagnetic layer and which is stacked on the opposite side of the free ferromagnetic layer from the non-magnetic spacer layer; and

an electron-reflective layer which is disposed adjacent to the back layer and which is stacked on the opposite side of the back layer from the free ferromagnetic layer.

18. A circuit comprising:

an amplifier; and

a magnetic sensing head having:

a free ferromagnetic layer;

a pinned ferromagnetic layer;

a non-magnetic spacer layer which is sandwiched between the free ferromagnetic layer and the pinned ferromagnetic layer;

an anti-ferromagnetic layer which is disposed adjacent to the pinned ferromagnetic layer;

a non-magnetic back layer which is disposed adjacent to the free ferromagnetic layer and which is stacked on the opposite side of the free ferromagnetic layer from the non-magnetic spacer layer; and

an electron-reflective layer which is disposed adjacent to the back layer and which is stacked on the opposite side of the back layer from the free ferromagnetic layer.

19. An apparatus comprising:

means for forming a free ferromagnetic layer;

means for forming a pinned ferromagnetic layer;

means for forming a non-magnetic spacer layer which is sandwiched between the free ferromagnetic layer and the pinned ferromagnetic layer;

means for forming an anti-ferromagnetic layer which is disposed adjacent to the pinned ferromagnetic layer;

means for forming a non-magnetic back layer which is disposed adjacent to the free ferromagnetic layer and which is stacked on the opposite side of the free ferromagnetic layer from the non-magnetic spacer layer; and

means for forming an electron-reflective layer which is disposed adjacent to the back layer and which is stacked on the opposite side of the back layer from the free ferromagnetic layer.

20. The apparatus of claim 19 wherein the means for forming the electron-reflective layer further comprises:

means for forming a film of a material on the non-magnetic back layer; and

means for oxidizing the film of the material.